LETTERS TO THE EDITOR.

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Cancer and Parthenogenesis.

MAY I be allowed to refer to the interesting and stimulating discoveries of Messrs. Farmer, Moore and Walker, and Drs. Bashford and Murray? The former have demonstrated that nuclear changes occur in cancerous tissues, by which cells of malignant growths may be justly considered homologous to active sexual elements ("gametoid"). Giant cells are suggested to be "fusion-figures" which recall normal fertilisation (*sic*) in cancer.

I write to ask if botanists or zoologists are of the opinion that "post-heterotypic" cells (homotypic) are "inclined" at all to develop without fertilisation by the spermatozoon (*i.e.* by parthenogenesis from ? chemical stimulus).

Does parthenogenesis occur in the embryosac of flowering plants or in the prothallium of the higher cryptogams under any and what conditions?

On what known states does parthenogenesis in the eggs of the honey bee, in ascaris, in artemisia, &c., depend?

This sexual character of the cells of cancer explains partly its parasitic and invading nature; the wonderful power of mimicry of the tissues from which they originate suggests that metastases commence as cells self-fertilised and maturating. A knowledge of the (? chemical) causes underlying both these changes might afford a clue to prevention. F. BUSHNELL.

S. Devon Hospital and Public Dispensary, Plymouth.

IN reply to the queries contained in the letter of Dr. Bushnell, it may at once be said that parthenogenesis is known to follow the application of certain stimuli in the case of a few animals and plants, Loeb's experiments on sea-urchins and Nathansohn's observations on Marsilea furnishing instances to the point.

Parthenogenesis occurs in the embryosac of species of Alchemilla, perhaps also in some species of figs, but the underlying conditions are not yet understood.

In other examples of parthenogenesis, as noted in animals, it arises in consequence of the lack of separation of the second polar body from the egg, or follows on the re-fusion of it with the egg. This represents, perhaps, a modified kind of fertilisation. Apogamy as occurring in ferns is a more remote event, but is apparently possessed of a similar significance.

I quite agree with Dr. Bushnell as to the importance of reaching an understanding of the chemical and other agencies that produce the change in cells previously normal, and the concluding paragraph of the article to which he refers emphasises this side of the subject.

J. B. FARMER.

Magdalen College, Oxford, February 13.

On a Dynamical System illustrating the Spectrum Lines and the Phenomena of Radio-activity.

BY the study of a system of particles, which is similar to a Saturnian system, I was led to the discussion of disturbances which propagate in the system, having close analogy with the band and line spectra while illustrating the phenomena of radio-activity. The system consists of a large number of particles of equal mass arranged in a circle at equal angular intervals, and repelling each other with forces inversely proportional to the square of distance between the particles; at the centre of the circle is placed a large particle attracting the other particles forming the ring according to the same law of force. If the repelling particles be revolving about the attracting centre, the system will generally remain stable for small oscillations, which consist of the transversal vibration perpendicular to the plane of the orbit, together with the radial and angular disturbances representing the rarefaction and condensation in the distribution of the particles. Small oscillations of this kind have already been treated by Maxwell in his essay on the stability of Saturn's rings; the system will be the same if the repelling particles of the present system be substituted by the attracting satellites. Evidently the system here considered will be approximately realised if we place negative electrons in the ring and a positive charge at the centre. Such an ideal atom will not be contradictory to the results of recent experiments on kathode rays, radio-activity, and other allied phenomena.

The frequency of the transversal vibration is given by

$$n = \omega - am^2 + bm^4 + \ldots,$$

where ω is the principal term and m the whole number. Plotting the lines of frequency, we find the crowding of lines when the value of m is small and when it is large. Generally the coefficient $a > 0$, so that with increasing m the frequency decreases, and the interval between the lines becomes wider. The distribution of lines resembles that of a band spectrum proceeding from violet towards the red. Taking the converging point of the lines for large values of m as the beginning, it is convenient to count the lines from the point, which I suppose to correspond to $m = m_0$. Then putting

$$m = m_0 - m'$$

we obtain, remembering that $\delta n = 0$ for $m = m_0$,

$$n = \omega' + a'm'^2 + b'm'^3 + \ldots$$

n increases with m', and the distribution resembles the band spectrum of carbon type, the interval between the lines gradually widening from red towards the violet. In fact, the above equation is an extension of Deslandres's formula.

If we suppose that the particles are negative electrons, we can easily prove that the transversal vibration will not be sensibly affected by the external magnetic field. This is another characteristic of the band spectrum.

The radial and angular waves propagating round the ring have frequencies given by

$$n = \frac{C}{\sqrt{1 - Am^2 + Bm^4 + \ldots}}$$

The distribution of lines is such that they crowd together for tolerably large values of m towards a region of high frequency, and is in its general aspect similar to a band spectrum, with the difference that the interval between the successive lines is about nine times wider than in the band spectrum above described. This we may identify with the line spectrum, although m is not the same as in the formula of Kayser and Runge, or of Rydberg. The supposition that the particles are electrons leads to the conclusion that a single line is separated into doublets, circularly polarised in opposite senses.

The ring here considered is quasi-stable. It may be set to disturbances the radial and angular components of which are nearly proportional to

$$e^{\kappa\nu t},$$

where κ is a constant, ν the number of particles in a ring, and t the time. If the disturbance continues for a sufficiently long time, the ring will be torn asunder and the system will fly off with great velocity. If the particles are electrons, those in the ring will give rise to β rays, and the central positive charges will form the α rays.

The ideal atom here considered will have high atomic weight when ν is large; consequently the instability is easier to produce when the atom is massive. Where there are several series of regular spectra we shall have to consider different rings of particles giving rise to these different sets. The complexity of spectrum is by no means a guarantee for the heaviness of atom; on the contrary, if high atomic weight is accompanied with comparatively simple spectral structure, we may consider that the system of rings is less complex, and ν may be quite a large quantity. This probably accounts for the remarkable radio-active property of radium, which, in spite of its high atomic weight, presents only a certain number of characteristic spectrum lines.

The kinetics of the system here considered may be extended to investigations which have analogies with the flutings of spectrum lines. Considered as electrons, the phenomena of actino-electricity, the ionisation of flames, the change of resistance of semi-insulators by exposure to light, the problem of coherer, the phenomena of fluorescence and

phosphorescence, and many allied subjects will probably be accounted for by the discussion of resonance and forced oscillations, to which the system is susceptible.

The above results were communicated to the Physico-mathematical Society of Tokyo in December last; the details of calculation will probably appear in the *Philosophical Magazine* in the near future. H. NAGAOKA.

Physical Laboratory, Tokyo University, January 18.

Science in the Navy.

IN view of the important articles which appeared in NATURE last year on the question of science in the navy, it seems desirable to inquire into the amount of encouragement which is now given to young lieutenants to adopt either of the more scientific branches of their profession.

Apart from zeal for the service and the love of knowledge, the most potent incentive to their doing so lies in the promise of early promotion to commander. Now, of the thirty-five lieutenants promoted on January 1 last, the following analysis will show that the more scientific officer has no advantage over his fellow as regards promotion. The periods between promotion to lieutenant and to commander were:—

	12	Lieutenants of the general service	10·8 years.
Lieutenants of special attainments	8 ,,	Gunnery officers ...	10·9 ,,
	6 ,,	Torpedo ,, ...	10·8 ,,
	9 ,,	Navigating ,, ...	11·9 ,,

From the above it is evident that no advantage accrued to those who had the ability to attain the scientific knowledge required for their respective branches, whilst the future of those who selected navigation was marred by having to wait a year longer than any other officer.

Lastly, it may be remarked that it argues well for a service in which science is courted by so many in spite of the small encouragement given in this matter of promotion.

N. G. T.

Organisms and Meteorites.

I SHOULD be glad to know whether anyone has ever attempted to test the hypothesis of Helmholtz and Lord Kelvin that meteorites are possibly the carriers of organised matter. By pulverising a portion taken from the interior of a meteorite it would, I should suppose, be easy to dissolve out and detect any organic matter that was there. The result in any particular case would probably be negative; still, wilder experiments have been tried before now. JAMES WARD.

Trinity College, Cambridge, February 15.

The Gordiidæ in Folk-lore.

THE sudden appearance of the Gordiidæ or hair worms in puddles of water or similar situations has caused the primitive peoples of many countries to evolve a theory of their seemingly mysterious origin. In parts of Scotland they are believed to be the intermediate stage in the development of a horse-hair into an eel; in Iceland and the Færöes, and also in some of the Malayan islands, they are thought to come down with the rain; in the Malay Peninsula they are said to be the offspring of an unnatural union between an earthworm and a female mantis, and to turn into a fern (Lygodium sp.), the creeping rhizome of which some of them (for example, *Chorodes montoni*, Camer.) closely resemble. (I found that a very large proportion of the true Mantidæ were infested by them in the Malay States.) In the same country, by an application of the principle of the doctrine of signatures, they are used in the manufacture of a hair-wash. I have thought that it might be interesting to trace out the beliefs held about them among different races, but I find references to them extremely scanty in ethnographical or general literature. If any of your correspondents could furnish information of the kind I would be extremely grateful, for I believe that an interesting contribution to the biological philosophy of savages might be made by collecting and analysing the different theories held by primitive peoples regarding a small and easily recognised group of animals like the Gordiidæ. NELSON ANNANDALE.

34 Charlotte Square, Edinburgh.

THE ANTARCTIC EXPEDITIONS.

MORE or less detailed accounts have now been published of all the three expeditions—German, Swedish, and Scottish—which, following the lead of the British party in the *Discovery*, have during the past two years striven to extend the bounds of knowledge in the far southern regions. Some idea can therefore be gained of the scientific results obtained in various directions. It is a remarkable illustration of the independence of climatic conditions on mere latitude that, while each of the expeditions wintered outside the Antarctic circle, the rigours experienced have hardly been exceeded in the case of expeditions which have wintered more than 10° nearer the pole in both hemispheres.

To begin with the work of the Swedish party under Dr. Nordenskjöld, of which summaries have been given both in the *Times* and in the *Geographical Journal*, it is mainly of the contributions to meteorology and geology that it is yet possible to speak, though when the magnetic observations have been worked out, results of no less importance may be expected. The value both of the meteorological and magnetic work has been greatly enhanced by the enforced detention during two winters, a much more effective basis of comparison with the observations of other expeditions and stations being thus supplied. Some useful work from a purely geographical point of view has also been accomplished, our knowledge of the contours of the land masses to the south of South America having received welcome additions, mainly as the result of two separate sledge expeditions undertaken during the two winters. The winter station, it will be remembered, was established on the eastern side of Louis Philippe Land, the northern extremity of the mass known further south as Graham Land. It was itself on an island lying to the east of the main mass, but although this appears to be fringed on this side by a regular archipelago of islands separated by wide channels, it was demonstrated—and this is one of the chief geographical results of the expedition—that the larger mass runs continuously southward from Louis Philippe Land to King Oscar Land. It is formed by a high range of mountain peaks separated by large glaciers, and further inland passing into a level ice-covered plateau. Within the outer limit of the archipelago an ice-sheet extended, bounded by a formidable ice barrier running from east to west in the neighbourhood of Christensen Island (an extinct volcano). The conditions of this ice-sheet recalled those of Ross's great ice-barrier on the opposite side of the Antarctic, and, as was found by Captain Scott and his companions on their great southern sledge journey, it was separated from the land by wide, deep, and impassable crevasses. This was ascertained during the first winter expedition, which lasted from September 30 to November 7, 1902, and had its furthest point in 66° S., 62° W. During the second winter the leader, with one companion only, explored the channels leading north behind the islands towards Erebus Gulf. The scenery here was found to be of the grandest kind; on one side was the magnificent range of King Oscar Land, on the other a large archipelago forming a remarkable contrast to the former, and made up of tufaceous volcanic rocks, with sounds, glaciers, and promontories, all dominated by the shining blue-white prominent peak of Mount Haddington, probably formed by a mighty crater. It was during this expedition that Dr. Nordenskjöld luckily fell in with Dr. Andersson and Lieut. Duse, who had left the *Antarctic* before the disaster which befel it, and had spent the winter in that inhospitable region with only a summer outfit.

Throughout the time spent in the far south, the